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Parasitic worms of forest micromammalians (*Rodentia*
and *Insectivora*) of the environment of Puławy
(district Lublin). II. *Trematoda*

Robaki pasożytnicze drobnych ssaków leśnych (*Rodentia* i *Insectivora*)
okolicy Puław (woj. lubelskie). II. *Trematoda*

It should be stressed with due appreciation that the investigations of the fauna of parasitic worms of micromammalians (*Rodentia* and *Insectivora*) in our country initiated in 1949 by Sołtys became a fascinating theme to a numerous group of investigators. The sphere of interest included initially forest insectivorous and rodents but expanded also to small field mammals. The field of investigations was widened also by a new group of hosts. Besides the "traditional" family *Muridae* interest was taken in the family *Sciuridae*. Of the insectivorous mammals besides the family *Soricidae* also the family *Talpidae* became the subject of studies.

At the present moment the Polish literature contains quite a number of works dealing with the subject: Sołtys (1949, 1952, 1954, 1957); Żarnowski (1954, 1955); Furmaga (1956, 1957, 1959); Pojmańska (1957, 1959); Rybicka (1958, 1959); Dorosz (1958); Czapski (1958); Kisielewska (1959). Besides works of a systematic and faunistic character initiated are also works which deal with the development of the parasites (Pojmańska, 1959; Kisielewska, 1959).

The area of investigations which was not long ago limited to the Białowieża Wilderness (Białystok district) became extended to new centres in the following districts: Lublin, Warszawa, Poznań, Wrocław and Opole.

This modest summing up of the ten years lasting studies on the micromammalians of the order *Rodentia* and *Insectivora* entitles to make a statement, especially as further studies on this subject are continued, that soon these groups of hosts will be included to animals well elaborated as regards their sets of parasitic worms.

The present work is a continuation of the previously published studies (Żarnowski, 1955) dealing with the fauna of tapeworms of forest micromammalians (*Rodentia* and *Insectivora*) of the environment of Puławy.

The fauna of trematodes collected and elaborated presently originates from the same host material.

In the course of one year 443 complete helminthological dissections were performed on hosts listed in the Table I.

Table I

Order	Host species	No. of exam. spec.
<i>Rodentia</i>	<i>Clethrionomys glareolus</i> Schreb.	80
	<i>Microtus agrestis</i> L.	1
	<i>Microtus ratticeps</i> Keyser. et Blas.	3
	<i>Microtus arvalis</i> Pall.	77
	<i>Microtus subterraneus</i> Ling.	18
	<i>Micromys minutus</i> Pall.	8
	<i>Apodemus agrarius</i> Pall.	18
	<i>Apodemus flavicollis</i> Melch.	1
	<i>Apodemus sylvaticus</i> L.	24
	<i>Mus musculus</i> L.	2
<i>Insectivora</i>	<i>Sorex araneus</i> L.	134
	<i>Sorex minutus</i> L.	41
	<i>Neomys fodiens</i> Schreb.	11
	<i>Crocidura leucodon</i> Herm.	25

In the total number of 232 examined rodents one was invaded with trematodes what constitutes 0.43%.

In the total number of 211 examined insectivorous mammals there were 20, that is 9.49%, invaded with trematodes.

The diagnosed species of trematodes in the separate hosts and the data concerning their frequency of occurrence are shown in

the Table II. (In hosts not shown in this table no trematodes were found).

The above data point to a very small extensity of invasion of the trematodes in the examined hosts. Simultaneously they prove the monospecies character of invasion in one host individual. Exceptionally in one *Sorex araneus* occurred simultaneously two species of trematodes: *O. (R.) exasperatum* and *O. (R.) opisthovitellinus* in the alimentary tract, but in the various anatomical sections of this organ.

Table II

Host	Invaded	Organ	Trematode species.	No. of hosts
<i>Apodemus agrarius</i> Pall.	1	intestine tenue	<i>Plagiorchis stefański</i> Furmaga, 1956	1
<i>Sorex araneus</i> L.	11	oesoph., stomach	<i>Brachylaemus fulvus</i> Duj., 1843	4
		stomach	<i>Opisthioglyphe (Rubenstrema) exasperatum</i> (Rud., 1819)	5
		stomach, intestine	<i>Opisthioglyphe (Rubenstrema) opisthovitellinus</i> (Soltys, 1954)	2
		gall-bladder	<i>Dicrocoelium</i> sp.	1
<i>Sorex minutus</i> L.	4	stomach	<i>Opisthioglyphe (Rubenstrema) exasperatum</i> (Rud., 1819)	4
<i>Crocidura leucodon</i> Herm.	2	stomach	<i>Opisthioglyphe (Rubenstrema) exasperatum</i> (Rud., 1819)	2
<i>Neomys fodiens</i> Schreb.	3	stomach, intestine	<i>Opisthioglyphe (Opisthioglyphe) locellus</i> Kossack 1910	2
		gall-bladder	<i>Metorchis albidus</i> (Braun 1893) forma minor	1

The finding of *Opisthioglyphe (Rubenstrema) exasperatum* (Rudolphi, 1819) Dollfus, 1949 in *Crocidura leucodon* Herm. seems to be the first report of this kind.

Opisthioglyphe (Opisthioglyphe) locellus Kossack, 1910 was for the first time reported in Poland.

Descriptions

Brachylaemidae Joyeux et Foley, 1930

Syn.: *Harmostomidae* Odhner, 1912

Brachylaeminae Joyeux et Foley, 1930

Syn.: *Harmostominae* Braun, 1899; *Heterolopinae* Looss, 1899

Brachylaemea Joyeux et Foley, 1930*

Syn.: *Harmostomea* Witenberg, 1925

The present state of informations referring to trematodes belonging in the broad sense (s. l.) to the family *Brachylaemidae* permits to accept the main elements of Skrjabin's (1948) concept, which is based principally on Witenberg's (1925) system and partly on Sinitsin's (1931), and concerns the systematic system of the family *Brachylaemidae* s. str. There seems to be no doubt that especially such subfamilies as *Brachylaeminae* Joyeux et Foley, 1930 and *Leucochloridiinae* Poche, 1907 should be included to the common nearest higher systematic unit that is to one family. The general character of the biological cycle points to that, as well as the general plan of the anatomical structure of the two discussed subfamilies. The fact that a more detailed analysis of the morphology of the two subfamilies shows in the typical representatives of the subfamily *Leucochloridiinae* fairly considerable deviation from the basic structure of "*brachylaemus*" should be interpreted in respect of adaptation changes caused by the specificity of the ecological niche in which the representatives of this subfamily live (cloaca of birds). In this light, therefore, should be viewed the compact, oval shape of the body, strong development of the two suckers and even the shifting of the natural openings (genital and excretory) to the dorsal side of the body in the typical representatives of the genus *Leucochloridium* Carus, 1835.

The genus *Panopistus* Sinitsin, 1931 and the genus *Pseudochloridium* created recently by Pojmańska (1959) for the trematode *Ps. soricis* (Sołtys, 1957) (Syn. *Leucochloridium soricis* Soł-

* Skrjabin (1948) describing the systematic system of the subfamily *Brachylaeminae* reports: "triba *Brachylaemea* Skrjabin, 1948". But already in 1930 Joyeux et Foley discussing the problem of the nomenclature within the family *Brachylaemidae* reported: „La famille des *Harmostomidae* Odhner devient *Brachylaemidae*; la sous-famille des *Harmostominae* Braun devient *Brachylaeminae*; la tribu *Harmostomea* Witenberg devient *Brachylaemea*".

tys, 1951) constitute in a certain sense the intermediate link between the subfamilies *Brachylaeminae* and *Leucochloridiinae* therefore stress even more the closer relation of the two discussed subfamilies.

Taking this into consideration it seems to me that the separation of the subfamily *Leucochloridiinae* from the family *Brachylaemidae* and the creation of an independent family *Leucochloridiidae* as reported by Dollfus (1934) is at the present state of our informations no right.

However, the problem of the belonging to the proper subfamilies of some genera which are a part of the family *Brachylaemidae* remains still open. The genus *Urotocus* Looss, 1899 is located by Dollfus (1934) within the subfamily *Leucochloridiinae* (= family *Leucochloridiidae*) and he encountered a certain number of followers of his conception. Skrjabin (1948), however, following Witenberg's (1925) system sees this genus within the subfamily *Brachylaeminae*, separated into a separate tribe *Urotocea* Witenberg, 1925.

Can the terminal location of the genital pores be the sole criterium, which is deciding on the belonging of a given genus to such and not to another systematic unit of a higher rank? This question is positively answered by Dollfus (1934) and by some other authors, who separate from the subfamily *Brachylaeminae* the genera of the general form of the type "*brachylaemus*" characterized by the paraterminal (behind the posterior testis), or terminal location of the genital pores and transfer them either permanently or temporarily to the subfamily *Leucochloridiinae*. It seems to me that the factor of a decisive value should be the character of the biological cycle, which in some of its phases presents fairly essential differences between the typical representatives of *Brachylaeminae* and the typical representatives of *Leucochloridiinae*.

Taking into consideration this assumption I do not see at present, until the time of the final tracing of the development of the representatives of the genus *Urotocus* Witenberg, 1925, any necessity to separate this genus from the subfamily *Brachylaeminae*. On the other hand the doubts rightly entertained by Dollfus (1934) as regards the systematic position of the genus *Panopisthus* Sinitsin, 1931, do not justify the need of its instanteneous separation from the subfamily *Brachylaeminae* the more so, as

the developmental cycle of the genus *Panopistus* Sinitzin, 1931 indicates a close relation to this subfamily.

A similar, reserved attitude is accepted by Pojmańska (1959) in connection with the new genus *Pseudochloridium*. The authoress regards the final establishment of the systematic position of the mentioned genus, as well as that of the genus *Panopistus* Sinitzin, 1931 (may be within the new common to them subfamily — what would correspond to Dollfus' suggestion) as decidedly premature.

Ulmer (1951) represents a similar, although a more decisive opinion. The author gives a presentation of the characteristics of the subfamily *Brachylaeminae* Joyeux et Foley, 1930, corrected by himself and among others draws attention to the typical characteristic of the representatives of this subfamily: "genital pore ventral, median, submedian near posterior end or terminal".

The above considerations induce me to accept the subdivision of the subfamily *Brachylaeminae* Joyeux et Foley, 1930, into three tribes: *Ithyogonimea* Witenberg, 1925, *Brachylaemea* Joyeux et Foley, 1930 and *Urotocea* Witenberg, 1925, with the separation of the Witenberg's (1925) tribe — *Leucochloridea* into the subfamily *Leucochloridiinae* Poche, 1907, but within the family *Brachylaemidae* Joyeux et Foley, 1930; such an attitude corresponds to our present informations referring to this group of trematodes. Of course, this does not preclude possibilities to revise the discussed system in future as our informations gained on the biological cycles of *Brachylaemidae* become more precise.

However, the grounding already at present upon Witenberg's (1925) scheme and the differentiation of separate tribes within the subfamily *Brachylaeminae* which places on the first plane, among others, the diagnostic value of the extend of the posterior borderline of the vitellaria does not reflect the reality and may lead to wrong conclusions.

I propose, therefore, the following key for the determination of the tribes of the subfamily *Brachylaeminae* Joyeux et Foley, 1930:

- 1 (2) Body strongly elongated, tape-like, or thread-like. Passage of the uterine ascending into descending loop at a certain distance behind the ventral sucker *Ithyogonimea* Witenberg, 1925

- 2 (1) Body tongue-like. Passage of the uterine ascending into descending loop on the level of the ventral sucker, or before it
- 3 (4) Well developed suckers *Brachylaemea* Joyeux et Foley, 1930
- 4 (3) Suckers (particularly the ventral sucker) weakly developed *Urotocea* Witenberg, 1925

The too large range in the posterior extension of the vitellaria in the representatives of the tribe *Brachylaemea* (e. g. on the level of the ovary in some species of the genus *Brachylaemus* (Dujardin, 1843), or in the posterior end of the body in the genus *Ectosiphonus* Sinitsin, 1931) point against a rigid determination of the posterior borderline of those glands in the hitherto made diagnoses: on the level of the anterior rim of the anterior testis.

Presently, therefore, the characteristic of this tribe should be as follows:

Brachylaemea Joyeux et Foley, 1930 emend.

Syn.: *Harmostomea* Witenberg, 1925

Brachylaeminae of a small, or medium size, shape of the body elongated, usually tongue-like. Suckers of various size but always well developed. The uterus consists of an ascending and descending loop. The passage of one loop into the other is either on the level of the ventral sucker, or before it. The vitellaria take origin on various levels. Their posterior borderline fluctuates from the anterior testis up to the posterior end of the body. The testes are located in the median line of the body and the ovary, situated between them, may show a lateral displacement.

Parasites of the intestine of birds and mammals. Typical genus: *Brachylaemus* (Dujardin, 1843) Blanchard, 1847.

The set of genera within the tribe *Brachylaemea* remains still an open question. Taking into consideration the modern systematic presentation of this group of trematodes, two distinctly different views of Skrjabin (1948) and of Dollfus (1934) should be cited.

The first mentioned author continuing Witenberg's (1925) conception includes to the tribe *Brachylaemea* the following genera: *Brachylaemus* (Dujardin, 1843), *Glaphyrostomum* Braun, 1901, *Ectosiphonus* Sinitsin, 1931, *Entosiphonus* Sinitsin, 1931, *Panopistus* Sinitsin, 1931 and *Postharmostomum* Witenberg, 1923.

The second investigator, namely Dollfus, does not subdivide the subfamily *Brachylaeminae* into tribes and includes into the

subfamily besides the genus *Ithygonimus* Lühe, 1899 and *Scaphiostomum* Braun, 1901 (which belong to the tribe *Ithiagonimea* Witenberg, 1925) the following genera: *Brachylaemus* (Dujardin, 1843), *Glaphyrostomum* Braun, 1901, *Ectosiphonus* Sinitsin, 1931 and *Entosiphonus* Sinitsin, 1931. The latter four genera form the main bulk of the set of genera, which is the tribe *Brachylaemea* in the presentation of the first author. In this respect there is between the two cited investigators an agreement independent from the problem of the approval of the subdivision of the subfamily *Brachylaeminae* into tribes. However, there is a distinct difference in the attitude towards the genus *Panopistus* Sinitsin, 1931 and to the genus *Postharmostomum* Witenberg, 1923. Previously I attempted to prove why the genus *Panopistus* should continue to remain within the subfamily *Brachylaeminae* (exactly in the tribe *Brachylaemea*) in spite of the, may be correct but not supported by unquestionable evidences, suggestion of Dollfus.

The problem of the genus *Postharmostomum* is even more enigmatic. While Skrjabin (1948) and some other investigators, e. g. Ulmer (1951), regard the existence of this genus as a fact rising no doubts, Dollfus (1934) entertains objections to the purposefulness of the existence of the discussed genus and is of an opinion that all species which belong to the genus *Postharmostomum* should be included to the genus *Brachylaemus*. Dollfus does not even respect Witenberg's subdivision of the genus *Brachylaemus* into subgenera (*Brachylaemus* and *Postharmostomum*) and writes: "Le genre *Postharmostomum* Witenberg (in Skrjabine, 1923), même ramené au rang de sous-genere par Witenberg (1925), me parait fondé sur caracteres fragiles et arbitrares". Further on the author attempts to prove that such features which characterize a genus or subgenus *Postharmostomum* as: localization of the genital pores behind the anterior rim of the anterior testis, winding course of the caeca and characteristic course of the uterine loops, are an expression of individual variability and to a large degree depend on the state of maturity of the trematode. Therefore various individuals of the same species could be included to one or another genus (eventually subgenus).

Already the review of species which belong to the set of the genus *Postharmostomum* Witenberg, 1923, approved by many authors, gives rise to a number of objections as regards the cor-

rectness of the placing of some of the species in the discussed genus. Taking this into consideration, Dollfus' opinion seems to be even more correct. In spite of my inclination towards Dollfus' conception if I in my subsequent considerations treat the genus *Postharmostomum* as an independent systematic unit, then I should add that I am forced to do so because of the lack in my material of a wider set of the representatives of the subfamily *Brachylaeminae* what makes impossible to me to take a final and decisive attitude towards this question.

Basing, at least temporarily, on the species set of the tribe *Brachylaemea* Joyeux et Foley, 1930 presented by Skrjabin (1948) I can not express my approval to the too rigid establishment of the location of the genital pores in the separate genera of this tribe. Skrjabin appears to be disregarding the individual and species variability in spite of concrete evidences, which confirm this variability. As a consequence, this author presents a table for the determination of the genera of the discussed tribe which sometimes makes it impossible to determine correctly the genus of the investigated species.

To me there appears to be no doubt that all the genera which at present belong to the tribe *Brachylaemea* can be subdivided into three basic groups: (1) the first — is characterized by the location of the genital pores behind the posterior testis, includes one genus *Panopistus* Sinitsin, 1931; (2) the second — the genital pore in the space between the testes, is represented by one genus *Glaphyrostomum* Braun, 1901; (3) the third — includes the remaining genera characterized by the most anterior location of the genital pores, that is before, or on the level of the anterior testis, with the genera: *Brachylaemus* (Dujardin, 1843), *Ectosiphonus* Sinitsin, 1931 *Entosiphonus* Sinitsin, 1931 and *Postharmostomum* Witenberg, 1923. Too minute differentiation of the genera of this group on the basis of the location of the genital pores, such as: "genital pores before the anterior testis; genital pores directly before the anterior testis; genital pores on the level of the anterior rim of the anterior testis; genital pores behind the anterior rim of the anterior testis" — is an useless overshadowing of the variability of the discussed anatomical feature, because only the location of the genital pores in the area of the anterior testis is constant and the location before, on the level of the anterior rim, or behind the anterior rim of the anterior

testis are features, which characterize often the separate species, sometimes even only individuals. Therefore other criteria must be decisive, as regards the belonging of a genus within the above mentioned third group of genera of the tribe *Brachylaemea*.

To conclude I am proposing the following key for the determination of the genera belonging to the tribe *Brachylaemea* Joyeux et Foley, 1930:

- 1 (2) Genital pores behind the posterior testis *Panopistus* Sinitzin, 1931
- 2 (1) Genital pores before the posterior testis
- 3 (4) Genital pores between the testes *Glaphyrostomum* Braun, 1901
- 4 (3) Genital pores before, or on the level of the anterior testis
- 5 (6) Caeca show in their course regular, meandrine turns. Both loops (ascending and descending) of the uterus run along the body and form in transversal direction numerous uniform turns *Postharmostomum* Witenberg, 1923
- 6 (5) Caeca run a straight course, or show in their course slight, irregular foldings
- 7 (8) Two main excretory ducts (siphons), taking origin from the urinary bladder, run extraintestinally *Ectosiphonus* Sinitzin, 1931
- 8 (7) Two main excretory ducts (siphons), taking origin from the urinary bladder, run intrainestinally
- 9 (10) Prepharynx, if present, weakly developed, tubular *Brachylaemus* (Dujardin, 1843)
- 10 (9) Prepharynx well developed and provided with muscles, similar to pharynx *Entosiphonus* Sinitzin, 1931

Genus *Brachylaemus* (Dujardin, 1843) emend.

Syn.: *Brachylaima* Dujardin, 1843; *Heterolope* Looss, 1899; *Harmostomum* Braun, 1899.

Brachylaemea of small or medial dimensions. Body of a tongue-like form, more or less elongated. Cuticle smooth or covered with minute spines in the anterior part of the body. Suckers well developed. Prepharynx, if present, weakly developed, tubular. Caeca may form irregular distensions and straitenings, run in the form of straight or slightly folded trunks up to the posterior end of the body. Vitellaria take origin on various levels, their posterior borderline may reach even the anterior rim of the posterior testis. Genital pores are before the anterior testis or on the level of its anterior

part. The anterior borderline of the uterus (passage of the ascending into the descending loop) is on the level of the ventral sucker or before it. Siphons (main excretory canals taking origin from the urinary bladder) run intratestinally.

Intestinal parasites of birds and mammals. Intermediate hosts (I and II) — terrestrial snails. Typical species: *B. advena* Dujardin, 1843 (Syn. *B. migrans* Dujardin, 1845).

Brachylaemus fulvus Dujardin, 1843, emend. Blanchard, 1847

Syn.: *Brachylaima fulvum* Dujardin, 1843, *Distomum* (*Brachylaimus*) *migrans* var. *a* Dujardin, 1845; *Distomum* (*Brachylaemus*) *migrans* var. *a* Dujardin, 1845 — in Dollfus, 1934; ? *Harmostomum* (*Harmostomum*) *dujardini* Baer, 1928; ? *Brachylaemus dujardini* (Baer, 1928) — Thomas, 1953; *Panopistus europaeus* Soltyś, 1952; *Brachylaemus oesophagei* Shaldibin, 1953.

I found this species in the stomach and once in the oesophagus in 4 *Screx araneus* L. The largest number of trematodes of this species in one host was 6 specimens.

The lack in the recent literature of sufficiently accurate descriptions of the discussed species, what most likely is one of the cause of frequent not distinguishing of *B. fulvus* in recent times, induces me to present a description of this trematode based on my own material.

Body of the trematode of a tongue-like form, 2.01 — 2.41 mm in length, maximal width 0.48 — 0.80 mm. Anterior part of the body (up to the level of the posterior rim of the ventral sucker or slightly posteriorly to it) covered with minute spines. Posterior half of the body frequently has a folded cuticle. Dimensions of oral sucker 0.15 — 0.23 × 0.18 — 0.24 mm. Size of ventral sucker fluctuates within the limits 0.20 — 0.27 × 0.21 — 0.30 mm. Prepharynx weakly developed and very short, not visible in contracted individuals. Pharynx well developed, dimensions 0.11 — 0.15 × 0.12 — 0.16 mm. Caeca run a straight course and extend to the posterior end of the body. Frequently the intestinal trunks show slight folding in their course and various thickness of their separate sections. Excretory opening on the posterior end of the body. Relatively short and narrow urinary bladder makes a bifurcation behind the posterior rim of the posterior testis into two narrow siphons, which run to the anterior part of the body laterally, but in the intrainestinal space. On the level of pharynx, before the

bifurcation of the intestines, the siphons bend and run towards the posterior end of the body on the ventral side of the intestinal trunks. In posterior part of the body, in the interintestinal space, there are located in the median line two, more or less spherical testes (one behind the other) of dimensions: anterior — 0.22 mm,

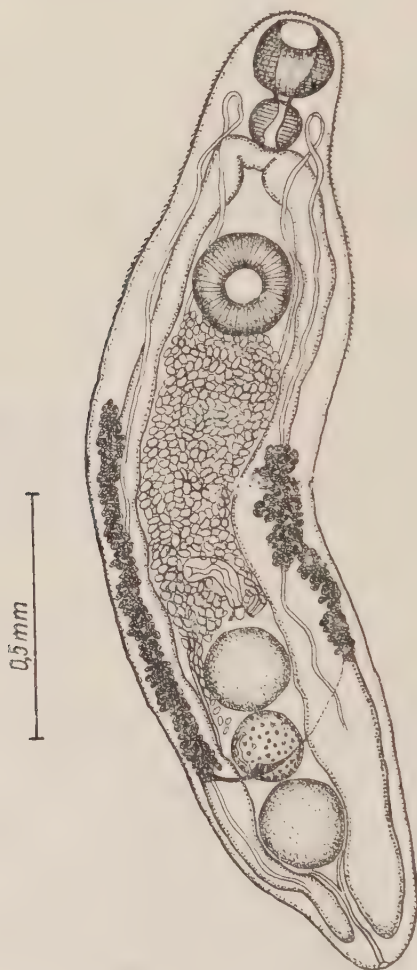


Fig. 1. *Brachylaemus fulvus* Dujardin, 1843

posterior — 0.18 — 0.23 × 0.18 — 0.22 mm. Cirrus pouch 0.148 mm in length. The arrangement of the genital pores is median, before the anterior rim of the anterior testis. Ovary located between testes,

spherical, dimensions: 0.19 — 0.21 mm. Vitellaria, located laterally, embrace the lateral rims of the intestinal trunks. Anteriorly they take origin behind the ventral sucker (not reaching it), posteriorly, however, they reach (frequently unilaterally) the level of the ovary, sometimes even the anterior rim of the posterior testis. Uterus, occupying the space between the anterior testis and the ventral sucker, never extends before the anterior rim of the latter. Numerous eggs, of yellow to brown colour, are $0.026 - 0.030 \times 0.012 - 0.017$ mm in size.

Final hosts: *Sorex araneus* L., *Sorex minutus* L., *Crocidura russula* (Herm.), *C. leucodon* (Herm.), *C. suaveolens* Miller., *Neomys fodiens* Schreb. Prokopič (1956, 1957, 1959) places on the list of final hosts by mistake *Sorex macropygmaeus* (*S. macropygmaeus karpiński* Dehnel) owing to faulty translation of the text of Sołtys' (1954) work.

Intermediate hosts: Pojmańska (1959) found the metacercaria of this trematode in the terrestrial snail *Zonitoides nitidus* (Müll.), and once also in *Goniodiscus rotundatus* (Müll.). If we accept as correct that *Harmostomum dujardini* Baer, 1928 is a synonym of *B. fulvus* Duj., 1843 then we should include to the intermediate hosts the snail *Agriolimax agrestis* (L.), in which Baer (1928) found metacercaria which correspond, according to the author, to this trematode.

Habitat in the final host: typical — oesophagus and stomach. Sołtys (1954), Prokopič (1956, 1957, 1959) and Shaldibin (1953) found this species also in the small intestine of the host. Besides the alimentary tract Shaldibin reports bronchia as a very rare habitat in the organism of the final host.

Geographical distribution: France — in *Sorex araneus* L. and *Crocidura russula* (Herm.); Czechoslovakia — in *Sorex araneus* L. and *Crocidura suaveolens* Herm.; Germany — in *Sorex araneus* L., *Neomys fodiens* Schreb. and *Crocidura leucodon* (Herm.); ? Switzerland — in *Sorex araneus tetragonurus*; Great Britain — in *Sorex araneus* L.; U.S.S.R. European — in *Sorex araneus* L., *Sorex minutus* L. and *Neomys fodiens* (Schreb.); Poland — in *Sorex araneus* L., *S. minutus* L. and *Neomys fodiens* Schreb.

According to my opinion there is no doubt that *Panopisthus europaeus* Sołtys, 1952 and *Brachylaemus oesophagei* Shaldibin, 1953 are synonyms of *B. fulvus*. Of the same opinion is also Pojmańska (1959) and Stammer (1955) and Prokopič (1959),

the latter authors — as regards *Panopistus europaeus*. However, the problem of the species *Harmostomum* (*Harmostomum*) *dujardini* Baer, 1928 is in my opinion not as easy to decide as presented among others by Thomas (1953) and Stammer (1955), who regard this species as *B. fulvus* Du j., 1843. Dollfus (1934) expresses serious doubts on the theme of *H. dujardini* and sees no possibilities of a final solution of this question. Pojmańska (1959) inclines rather to the opinion of the former authors, but she takes a reserved position.

In my opinion, to acknowledge *H. (H.) dujardini* Baer, 1928 as a synonym of *B. fulvus* Du j., 1843 we should accept the location of the genital pores and cirrus pouch on the level of the ovary — (therefore between the testes) in *H. (H.) dujardini* either as a very rare individual characteristic having nothing in common with a species characteristic (in spite of the fact that Baer found several individuals of this trematode), or as an observational error committed by the author (the description of the new species *Panopistus europaeus* Sołtys, 1952 was also based on an observational error). The latter alternative, taking into consideration the class represented by such an investigator as Baer is, I would rather dismiss. The discussed problem, in my opinion, remains still open.

Plagiorchiidae L ü h e, 1901

Syn.: *Lepodermatidae* Odhner, 1910

Plagiorchiinae Pratt, 1902

Syn.: *Lepodermatinae* Looss, 1899

Plagiorchis stefaniskii Furmaga, 1956

I found in one *Apodemus agrarius* Pall. in the small intestine three specimens of this trematode which unquestionably belongs to the genus *Plagiorchis* L ü h e, 1899. Detailed morphological analysis proved that, besides the difference in the general size of the parasites (one specimen is almost twice smaller from the two remaining) and the difference in the anterior location of the vitellaria, all the three specimens show identical anatomical structure, whereby the dimensions of their eggs lie within the same limits.

The mode of the anterior location of the vitellaria in my material would classify the three specimens found by me to two subgenera acknowledged by a large group of authors, who follow Schulz and Skvortsov (1931).

So the specimens 1 and 3 belonged to the subgenus *Plagiorchis* (lack of anterior junction of the vitellaria of the two sides), but the specimen 2 had to be placed within the subgenus *Multiglandularis* (junction of both sides of vitellaria before the ventral sucker).

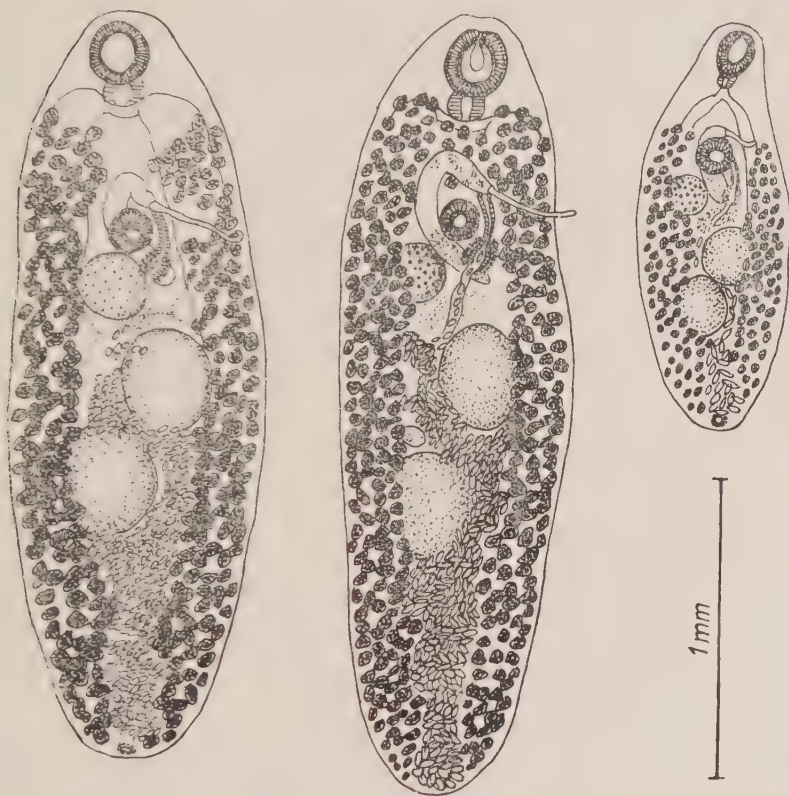


Fig. 2. *Plagiorchis stefanski* Furmaga, 1956.

I do not regard as possible to discuss my material from the point of view of species diversity. Both the agreement in structure and the arrangement of the remaining anatomical elements (specimens 1 and 2 show similar dimensional relations) as well as also the same environment and ecological niche (the same host individual and the same organ) — point against it. In this place it would be well to remember Gause's rule, which assumes the impossibility of an existence in the same ecological niche of two closely related species of identical requirements of the environment.

The fact that the dimensions in the specimen 3 are almost twice smaller than in the specimens 1 and 2 can be explained in this way that the specimen 3 (in comparison with the specimens 1 and 2) penetrated into the host later, therefore the discussed parasite either did not attain yet at the moment of detection full growth in spite of the presence of sexual maturity, or the previous invasion by producing in the host a certain state of intrainfectious immunity exerted a growth inhibiting effect and hindered the reproduction of the parasite at the repeated invasion (considerably smaller number of eggs in the uterus of the specimen 3).

The described material, therefore, should be discussed from the point of view of individual mutability. The specimen 1 should therefore occupy the intermediate place (vitellaria not united anteriorly and extend almost to the bifurcation of the intestine). The specimen 2 shows a distinct progress in the development of the vitellaria, while the specimen 3 a certain regress — anterior borderline of the vitellaria rather does not surpass the anterior rim of the ventral sucker.

After all I am not alone in pointing to the mutability in the arrangement of the vitellaria within the same species of the genus *Plagiorchis*. Furmaga (1956) describing the species *Pl. (Multiglandularis) stefaniskii*, which in my opinion is identical with my material anatomically (particularly specimen 2), ecologically (the same host and organ) and zoogeographically (the same district), also mentions that out of the 5 individuals of the discussed species in two the vitellaria of both sides did not form a junction in the anterior part of the body and interprets it by the not complete development of the specimens. A typical example of this mutability is *Pl. elegans* (Rudolphi, 1802). This species is by Skrjabin et Antipin (1958) included to the subgenus *Multiglandularis*, while Odening (1958) places it in the subgenus *Plagiorchis*. Fedorova (1954), according to Odening (1958) expresses the opinion that the mode of the anterior arrangement of the vitellaria is not in all species of the genus *Plagiorchis* a constant characteristic. Chalupský (1954) includes his species *Pl. blatnensis* to the subgenus *Plagiorchis* but at the same time draws attention to the fact that in a certain number of the individuals in his material it was impossible to determine exactly the subgenus belonging. Skrjabin et Antipin (1958) regard the subdivision of the genus *Plagiorchis* into the two discussed subgenera as essential

and correct and look upon the mutability in the anterior arrangement of the vitellaria in some species as on little meaning exceptions in the general rule and treat at the same time this mutability as a phenomenon occurring in accordance to the developmental rules. This statement cannot be denied and a practical conclusion can be drawn from it, namely that only when a material representing more numerous population is available, a proper classification of a given species and its systematic position can be made. Therefore the analysis of my scanty material, even on the basis of data presented by Furmaga (1956), makes it impossible to determine its belonging to the proper subgenus.

The above considerations give rise to a number of questions as regards many species of the genus *Plagiorchis*. These doubts induced lately a number of investigators to submit to a revision of the species set of this genus. And so Fedorova, 1954 (according to Skrjabin et Antipin, 1958) acknowledges out of the total number of 82 species only 33, and regards the remaining species as synonyms. Bychovskaja-Pavlovskaja, 1956 (acc. to Skrjabin et Antipin, 1958) takes a similar attitude towards numerous species of the genus *Plagiorchis* occurring in birds in the U.S.S.R. In spite of certain differences in the arrangement of some species, the two authoresses in the majority of cases express the same opinion and base in their revisions on detailed morphological analysis. The authoresses admitting the occurrence of the intraspecies mutability disregard, however, completely factors of bioecological nature.

Thus such species, as: *Pl. maculosus* (Rudolphi, 1802), *Pl. brauni* Massino, 1927, *Pl. multiglandularis* Semenov, 1927 would have on the list of their hosts not only numerous birds, but also mammals.

To the discussed problem Odening (1958) takes an even more radical attitude, because removing (most correctly) a certain number of species from the genus *Plagiorchis* (in accordance with the modern definition of this genus) he makes maximum use of the synonymy for the remaining species typical to *Plagiorchis*, forms a number of subspecies, and species morphologically similar he joins into groups. As far as the conception of the group arrangement of species seems to be correct and deserves closer attention, the species set of groups gives cause to certain objections. It is regrettable that the author failed to present the basic features characterizing the separate groups because it would contribute

towards better understanding of his point of view. Theoretical group classification of my material, made according to Odening's conception, would result that the specimen 1 should be in the group "*elegans* — *triangularis*", specimen 2 in the group "*cirratus* — *laricola*" and the specimen 3, while exhibiting characteristics of the group "*elegans* — *triangularis*", by the proportion of the ventral sucker to the oral sucker would correspond to the group "*maculosus*".

The too free use of synonymy and numerous subspecies give rise to a number of reservations. Odening, considering the weak specificity of the species of the genus *Plagiorchis* towards the final host, is directed exclusively by the similarity of anatomical nature and dismisses completely bioecological criteria. Should similarity of structure decide that several species parasitizing in different orders of birds and mammals are regarded as one species unit? Can few reports on the possibility of experimental invasion of a host systematically distant and different from natural hosts with some species of the genus *Plagiorchis* be an evidence that the parasite is in Nature provided with such a wide range of different hosts?

I cannot deny that the revisions of the genus *Plagiorchis* made by Fedorova (1954), Bychovskaja-Pavlovskaja (1956) and Odening (1958) introduced some creative elements corresponding to the natural state of affairs, but in many instances their conceptions are at least proofless and not convincing.

Skrjabin et Antipin (1958), analyzing the revisions made by Fedorova and Bychovskaja-Pavlovskaja, regard them either as too radical and impossible to accept, or as requiring discussion and supplementary studies. This correct opinion should not lead to the prevention from attempts to arrange the species set of the genus *Plagiorchis*, as exhibited by Skrjabin et Antipin (1958), because undoubtedly certain species should be regarded as unreal. Certainly within the genus *Plagiorchis* cannot remain a number of species which by the posterior extend of the vitellaria and uterus show disagreement with the characteristic of the discussed genus.

My exceedingly scanty material represented by one single species offers no basis for a broader review of the genus *Plagiorchis* and does not entitle me to make a detailed analysis of this group of trematodes. If I attempted to base only on data in the literature, which present most commonly the separate species in a static way,

then on the ground of the mutability observed in my material the conclusions would have to be wrong.

Therefore even the species classification of my material presents a problem not fully answered.

There is no doubt that my material is identical to *Pl. stefañskii* described by Furmaga (1956) from *Apodemus sylvaticus* and *Apodemus agrarius*. May be that *Pl. raabei* Furmaga, 1956, found in *Apodemus agrarius* (in which the vitellaria of both sides make no junction before the ventral sucker), is still another form of the mutability of this species. Extremely similar to *Pl. stefañskii* is *Pl. blatnensis* Chalupský, 1954 (in *Microtus arvalis*), but the size and the posterior extend of the cirrus pouch of this species give no basis to regard it as synonymous to *Pl. stefañskii*. *Pl. muris* (Tanabe, 1922) shows also similarity to my material, but in my opinion it represents, however, a separate species.

Other species described in mammals differ distinctly from my material, although *Pl. massina* Petrov et Tichonov, 1927 shows a certain range of a morphological concurrence*.

Taking into consideration factors of a bioecological nature (in spite of similarities) I would not regard *Pl. stefañskii* as synonymous to any species parasitizing not in mammals as long as the sole basis for comparisons are only morphological data, which most commonly do not present informations on the range of the mutability of the species.

If the conception of Fedorova, Bychovskaja-Pavlovskaja and Odening find natural corroboration, then most likely *Pl. stefañskii* will loose its autonomy as a species.

For a more detailed presentation of my material I am giving the following data: Cuticle covered with spines on the whole surface, whereby the occurrence of spines is most dense and most distinct in the anterior half of the body of the trematode. Similarly to the description presented by Furmaga (1956) for *Pl. stefañskii* and by Chalupský (1954) for *Pl. blatnensis* — also in my material the terminal section of the uterus is surrounded by an aggregate of glands. The mentioned authors regard them as Mehlis' gland. In my opinion the described aggregate of glands which surround the initial section of the muscular metraterm represents by itself a group

* The species *Pl. polonicus* described by Sołtys (1957) in *Microtus agrestis* is in my opinion a certain form of the mutability of the species *Pl. arvicolae* Schulz et Skvortcov, 1931.

Table III

Data	Specimen 1	Specimen 2	Specimen 3	<i>Pl. stefaniskii</i> Furmaga, 1956	<i>Pl. raabei</i> Furmaga, 1956	<i>Pl. blattensis</i> Chalupský, 1954
Length	2.64	2.81	1.47	1.99 - 2.45	1.91	2 - 2.6
Width	0.88	0.084	0.55	0.651 - 0.840	0.378	0.6 - 0.8
Oral sucker	0.22 × 0.21	0.24 × 0.22	0.15 × 0.13	0.126 - 0.210	0.147	0.17 - 0.22
Ventral sucker	0.17 × 0.16	0.17 × 0.13	0.14 × 0.14	0.105 - 0.157	0.063	0.12 - 0.17
Pharynx	0.12 × 0.14	0.15 × 0.15	0.03 × 0.07	0.081 × 0.105	0.084 × 0.073	0.1 - 0.104
Oesophagus	invisible	invisible	0.028	0.03	0.02	0.032
Length of cirrus pouch	0.61	0.72	0.30	0.478 - 0.535	0.380	0.23 - 0.26
along the curvature in straight line	0.44	0.49				
Testis I	0.36 × 0.32	0.36 × 0.28	0.278 × 0.19	0.315 × 0.210 - 0.231	0.186	0.25 - 0.36 ×
Testis II	0.40 / 0.34	0.40 / 0.30	0.234 - 0.20	0.27 - 0.42 × 0.21 - 0.315	0.189 - 0.126	0.18 - 0.29
Ovary	0.24 × 0.22	0.23	0.14 - 0.13	0.21 - 0.23	0.105	0.16 - 0.20
Eggs	0.036 - 0.039 × 0.018 - 0.020	0.039 - 0.041 × 0.018 - 0.020	0.039 × 0.018	0.035 - 0.037 × 0.022 - 0.024	0.031 - 0.033 × 0.018 - 0.020	0.038 - 0.040 × 0.022 - 0.024
Host	<i>Apodemus</i>	<i>agrarius</i>		<i>A. sylvaticus</i> <i>A. agrarius</i>	<i>A. agrarius</i>	<i>Microtus</i> <i>arvalis</i>
Geogr. distrib.	Poland, environment of Puławy			Poland, Lublin district		
				Czechoslovakia		

of glandular cells, occurring frequently in the course of the terminal section of the uterus in many trematodes and should not be identified with the proper Mehlis' gland. To be true, the latter gland is in my material not distinctly visible in the place of its typical localization, but the example of *Pl. megalorchis* Rees, 1952, the drawings of which show beside the typically located Mehlis's gland also the presence of the aggregate of glandular cells at the initial section of the metraterm (passage of the thin-walled uterus into the muscular metraterm), should the discussed question sufficiently illustrate.

The prepharynx was not observed in my material. While in the specimen 3 a very short oesophagus is marked, in the specimens 1 and 2 it was not visible. The intestinal trunks in all the three specimens extend to the posterior end of the body of the trematode. The corresponding dimensions expressed in mm are presented in the enclosed table III together with the dimensions given by Furmaga (1956) for *Pl. stefańskii* and *Pl. raabei*, and by Chalupský (1954) for *Pl. blatnensis*.

Opisthioglyphinae Dollfus, 1949

The so called „group *Opisthioglyphe*”, which includes the genus *Opisthioglyphe* Looss, 1899 and related genera was by Dollfus (1949) rightly comprised into the common subfamily *Opisthioglyphinae* and left in closest neighbourhood with the subfamily *Plagiorchiinae* Pratt, 1902.

However, greatly troublesome is the question of the set of genera (and their characteristic) which are comprised within the discussed subfamily. To the present date three attempts to make a detailed revision of this subfamily are recorded. Travassos (1930) subdivides the „group *Opisthioglyphe*” into three genera: *Opisthioglyphe* Looss, 1899, *Dolichosaccus* Johnston, 1912 and *Rudolphiella* Travassos, 1924, treating the genus *Brachysaccus* Johnston, 1912 at the highest only as a subgroup within the genus *Opisthioglyphe* and placing at the same time the genus of Perkins (1938) — *Lecithopyge* — in synonyms of the genus *Dolichosaccus*. It should be repeated after Baer (1943) that the genus *Rudolphiella* with the species *R. rudolphi* Travassos, 1924 completely does not correspond to the basic characteristic of the subfamily *Opisthioglyphinae* (posterior extend of the uterus)

and thus within the discussed group cannot be taken into consideration. The genus *Opisthioglyphe* in Travassos' presentation is so strikingly diverse and the confrontation of the characteristic of the genus with the characteristics of its separate species in Travassos' presentation shows so many contrasts that such a constructed genus becomes a completely artificial and unreal systematic position.

Baer (1943) and Dollfus (1949) analyzing the discussed group of trematodes are in agreement as to the subdivision of the group into genera, namely: *Opisthioglyphe*, *Dolichosaccus* and *Brachysaccus*.

In my opinion such a subdivision of the subfamily *Opisthioglyphinae* is at the present state of our informations wholly correct.

The question of the fundamental characteristic features of these genera on the basis of anatomical marks of the species belonging to them requires, however, discussion and certain corrections.

According to Baer (1943) the fundamental feature differentiating the mentioned three genera is the location of the genital pore: before the ventral sucker — the genus *Opisthioglyphe*; before the intestinal bifurcation — the genus *Brachysaccus*; on the level of the intestinal bifurcation — the genus *Dolichosaccus*. In the second turn this investigator mentions the spatial arrangement of the uterus, size of the cirrus pouch and length of the Laurer's canal.

It seems to me that the location of the genital pore before the intestinal bifurcation is such a characteristic feature that Baer's conception to join all species of such a location of the genital pores into the common genus *Brachysaccus* should be accepted as a correct one.

However, the separation of the remaining two genera in the first line on the basis of the location of the genital pores: before the ventral sucker (this should be understood that the genital pore lies nearer the ventral sucker than the intestinal bifurcation), and on the level of the intestinal bifurcation (therefore at a distant from the sucker), but in both cases behind the bifurcation — is dangerous because it may lead to excessive subjectivism of the investigators in the evaluation of their own material which represents frequently a various degree of individual and population mutability and also a various state of fixation. While the posterior extend of the uterus in Baer's presentation as regards the genus *Brachysaccus* (the uterus does not reach the anterior testis) is in the given case

not essential and even partly is a contradiction to the facts (in the species *B. anartius* Johnston, 1912 and *B. symmetrus* Johnston 1912 the uterus reaches the anterior testis) — then to the differentiation of the genera *Opisthioglyphe* (the uterus lies between the genital pore and the anterior testis) and *Dolichosaccus* (the uterus between the genital pore and the ovary) this characteristic becomes of a first rank importance. The proportion of the length of the cirrus pouch to the diameter of the ventral sucker should have only an auxiliary, complementary value, but should not have influence of the belonging of a species to such or another genus. If a whole number of species of diverse location and dimensions of the cirrus pouch belonging to the genus *Opisthioglyphe* raise no doubts by such a systematic position, then why should there be made certain reservations as regards the belonging of *B. ampicavus* (Travassos, 1924) to the genus *Brachysaccus*.

Finally, analysing the last attempt to revise this group of trematodes of Dollfus (1949) attention should be drawn to the too risky way of dealing with some characteristics of the genus *Opisthioglyphe* treating them as main, differentiating this genus from the two remaining genera, that is *Dolichosaccus* and *Brachysaccus*. Let us review this question closer on the basis of the table differentiating genera and subgenera and presented by Dollfus (1949). According to this author to the genus *Opisthioglyphe* belong species characterized by the lack or presence of the metraterm and by the absence or extremely short prepharynx. The lack of the metraterm and the presence of the prepharynx and oesophagus are characteristic of the two remaining genera. Devising, however, more closely the species which belonged to the genus *Opisthioglyphe* up to 1949 and taking into consideration only the few new species described under the generic name *Opisthioglyphe*, found in insectivorous mammals (Insectivora) in recent years, then the above characteristic features should be presented as the characteristics of the genus *Opisthioglyphe* in the following way: metraterm present or absent, prepharynx present or absent, oesophagus present or absent.

Can data of this kind serve as basic characteristics differentiating one genus from others? In my opinion further comments are superfluous.

However, Dollfus' mode of the differentiation of the two remaining genera one from the other: developed uterus above all before the ovary — genus *Dolichosaccus*; uterus well developed

both before as well as behind the ovary — genus *Brachysaccus* — is in my opinion most correct. It is only regrettable that Dollfus in his conception of the systematics of this group of trematodes omitted completely the generic important problem of the location of the genital pore.

On the basis of the above presented analysis I propose the following table of characteristics which have a value for the systematics of the subfamily *Opisthioglyphinae* Dollfus, 1949:

- | | |
|---|-------------------------------------|
| 1 (2) Genital pore before the bifurcation of the intestine | <i>Brachysaccus</i> Johnston, 1912 |
| 2 (1) Genital pore behind the intestinal bifurcation | |
| 3 (4) Uterus developed more or less uniformly between the genital pore and testes | <i>Opisthioglyphe</i> Looss, 1899 |
| 4 (3) Uterus developed mainly between the genital pore and ovary | <i>Dolichosaccus</i> Johnston, 1912 |

In this presentation, therefore, I am acknowledging the species which enter into the set of the separate genera cited by Baer (1943). And so to the genus *Brachysaccus* belong: *B. juvenilis* (Nicoll, 1918) and *B. amplicavus* (Travassos, 1924). To the genus *Dolichosaccus* are included: *D. diamesus* Johnston, 1912, *D. ischyryus* Johnston, 1912, *D. trypherus* Johnston, 1912.

The problem of the species set and taxonomical relations within the genus *Opisthioglyphe* remains still to be discussed.

Dollfus (1949) subdivides this genus into three subgenera: s. g. *Opisthioglyphe* with several species, s. g. *Rubenstrema* with the species *O. (R.) exasperatum* (Rudolphi, 1819) and s. g. *Lecithopyge* with the species *O. (L.) rastellus* (Olsson, 1876).

Shaldibin (1953) criticising the cited arrangement of Dollfus subdivides the genus *Opisthioglyphe* into two subgenera: s. g. *Opisthioglyphe* and s. g. *Neoglyphe*. The criticism of Dollfus' conception is in my opinion based on a misunderstanding. After all Dollfus did not exclude *O. rastellus* into a separate genus *Lecithopyge* (created in 1928 by Perkins), what is imputed to the French investigator by the Soviet author, but preserved the discussed species within the genus *Opisthioglyphe*, only, he opposed it to other species of this genus in the form of the separate subgenus *Lecithopyge*.

Shaldibin's subdivision of the genus *Opisthioglyphe* does not, in my opinion, correspond reality. If the mode of the posterior location of the vitellaria should be the basic difference between

the proposed subgenera then on what a basis is cited as typical to the subgenus *Opisthioglyphe* the species *O. ranae* (Froelich, 1791), characterized by the penetration of the vitellaria in the posterior part of the body of the trematode between (therefore internally) the intestinal trunks, when the diagnosis of the subgenus expresses something quite different.

The problem of the internal systematic relations within the genus *Opisthioglyphe* requires in the light of Dollfus' (1949) propositions a detailed review. First of all should be stressed the correct view of this investigator on the systematic position of *Distoma rubens* Du j., 1945 (= *D. exasperatum* Rud.). The proper place of this trematode can be only the circle of species included by the genus *Opisthioglyphe* (subfamily *Opisthioglyphinae*), but never *Plagiorchis* (subfamily *Plagiorchiinae*).

Correctly also the French investigator sees the need for the subdivision of the genus *Opisthioglyphe* into narrower, more compact subgroups, that is into subgenera. But the way in which Dollfus makes this subdivision does not correspond to our recent informations on the reviewed group of trematodes. It should be realized that presently besides the species of the genus *Opisthioglyphe* known up to 1949 and several new species described in recent times to the reviewed genus should be transferred species, which hitherto were comprised within the genus *Plagiorchis* Lühe, 1899 and which do not correspond to one of its basic characteristic features (in the new presentation), namely: the uterus in its posterior extend surpassing the posterior testis reaches the posterior end of the body.

In this situation the differentiation of the subgenera only on the basis of the extend and size of the cirrus pouch, presence or lack of the oesophagus and metraterm — the way taken by Dollfus, therefore on the basis of characteristics which in the light of the presently rich set of species are the feature of the species separateness only, and not of the group separateness — fails completely to play its role.

In my opinion, features of a group character seem to be: (1) the mode of the posterior location of the vitellaria, and (2) the ratio between the ventral and oral suckers.

Acknowledging the subgenera proposed by Dollfus I am presenting the following differentiating table of subgroups within the genus *Opisthioglyphe* Looss, 1899:

- 1 (2) Vitelline glands of both sides in the posterior end of the body do not join each other subg. *Opisthioglyphe* (Looss, 1899) Dollfus, 1949
- 2 (1) Vitelline glands of both side in the posterior end of the body join together
- 3 (4) Ventral sucker considerable larger than the oral sucker subg. *Rubenstrema* Dollfus, 1949
- 4 (3) Ventral sucker smaller or equal to oral sucker (In the latter case there may occur insignificant dimensional deviations concerning one or the other sucker) subg. *Lecithopyge* (Perkins, 1928) Dollfus, 1949

At the same time I am presenting my own characteristic of the subgenera:

Subgenus *Opisthioglyphe* (Looss, 1899) Dollfus, 1949

Ventral sucker smaller or equal to oral sucker. Prepharynx present or absent. Oesophagus present or absent. Intestinal trunks extend almost to the posterior end of the body. Cirrus pouch of various length and of a various posterior extend; it may reach even the anterior testis. Uterus posteriorly limited by the anterior testis. Testes most commonly located one behind the other. Uterus may sometimes reach the anterior rim of the posterior testis (individual intraspecies mutability). Metraterm present or absent. Vitelline glands reach anterior various level, sometimes both sides of the vitellaria join together before the ventral sucker (interspecies mutability). In the posterior end of the body behind the posterior testis the vitellaria of the two sides do not join together. Typical to the subgenus is the bending towards the front of the vitellaria by the blind termination of the intestinal trunks and the penetration by two bands (not joining) into the space between the intestines up to the posterior rim of the posterior testis.

Set of species:

- (1) *O. (O.) ranae* (Froelich, 1791) Looss, 1907: *Rana esculenta* L., *R. temporaria* L., *R. terrestris* Andr., *Bufo bufo* L., *B. variabilis* Pall., *B. calamita* Laur., *Hyla arborea* L., *Pelobates fuscus* Laur., *Triturus vulgaris* L., *T. cristatus* Laur.;
- (2) *O. (O.) locellus* Kossack, 1910 (Syn.: *O. (Neoglyphe) oschmarini* Shaldibin, 1953); *Neomys fodiens* Schreb., *Sorex araneus* L.;
- (3) *O. (O.) sobolevi* Shaldibin, 1953 (Syn.: *O. (Neoglyphe) sobolevi*: *Sorex araneus* L., *S. minutus* L.;
- (4) *O. (O.) soricis* Pojmańska, 1956: *Sorex araneus* L., *S. minutus* L., *Neomys fodiens* Schreb.

Attention should be drawn to the fact that *O. sobolevi* and *O. soricis* are very similar to each other. The size and the posterior extend of the cirrus pouch (up to the anterior testis) and the general plan of the structure are identical. The differences lie in:

- (1) the mode of the anterior location of the vitelline glands (union of the two sides of vitellaria before the ventral sucker in *O. soricis*, and a lack of this union in *O. sobolevi*),
- (2) the presence of prepharynx in *O. sobolevi* and its lack in *O. soricis*,
- (3) the presence of metraterm in *O. sobolevi* and its lack in *O. soricis*,

therefore I am not entitled to treat the discussed species as synonymous.

Referring to *O. adulescens* Nicoll, 1914 from *Vipera aspis* I support Baer's (1943) opinion on the unclear systematic position of this species. In my opinion it should not be included into the genus *Opisthioglyphe*. The species *Opisthioglyphe anomali* from *Neomys anomalus milleri* Mottaz described by Prokopič (1957) not long time ago gives rise to serious doubts. The too schematic drawing and the simply telegraphic original description do not offer a full picture of this species.

The drawing of *O. anomali* Prokopič, 1957 may lead to the conjecture that the uterus in its posterior extend reaches behind the posterior testis and thus approaches the posterior end of the body. In such a case this species could not at all belong to the subfamily *Opisthioglyphinae*. Further on, the drawing may suggest (in the description there is no hint whatsoever on this theme) that the location of the genital pores is before the intestinal bifurcation. In such a case, the discussed species should be placed within the genus *Brachysaccus* Johnston, 1912 if it corresponded to characteristics of the subfamily *Opisthioglyphinae*.

By the accordance with the characteristic of the genus *Opisthioglyphe* the discussed species should be comprised within the subgenus *Lecithopyge*.

Subgenus *Rubenstrema* Dollfus, 1949

Ventral sucker considerably larger than the oral sucker. Lack of prepharynx and oesophagus. Intestinal trunks reach the posterior end of the body. The cirrus pouch by its posterior end does not extend behind the posterior borderline of the ventral sucker (in

toto or in its major part lies before this sucker) (?). Testes (one close to the other) are located obliquely. The vitelline glands attain in the anterior part of the body various levels. Lack of union of the vitellaria of the two sides before the ventral sucker. In the posterior part of the body the vitellaria of both sides confluence and occupy the space between the posterior rim of the posterior testis and the posterior end of the body. The uterus in its posterior course penetrates between the two testes. The metraterm distinctly marked (?).

Set of species:

(1) *O. (R.) exasperatum* (Rudolphi, 1819) Dollfus, 1949: *Neomys fodiens* Schreb., *N. anomalus milleri* Mottaz, *Sorex araneus* L., *S. macropygmaeus karpiński* Dehnel, *Crocidura leucodon* Herm.;

(2) *O. (R.) opisthovitellinus* (Sołtys, 1954) Prokopič, 1959: *Neomys fodiens* Schreb., *Sorex araneus* L., *S. minutus* L., *S. macropygmaeus karpiński* Dehnel.

Makarenko (cited after Skrjabin et Antipin, 1958) described in 1958 *Plagiorchis* sp. from *Sylvia borin* Bodd. This species is characterized among others by the considerably larger ventral sucker than the oral sucker, by the posterior extend of the uterus which reaches to the half length of the posterior testis, by the confluence of the vitellaria of the two sides in the posterior part of the body, and by the cirrus pouch which by its posterior end reaches the ovary. On the basis of this description it can be assumed that the author dealt with only one individual of this species. If Makarenko's data, referring particularly to the dimensional relations between the two suckers and the posterior extend of the uterus, found their corroboration on a larger material; then this species should be included within the subgenus *Rubenstrema*. Of course, in the characteristic of the subgenus a correction should be introduced concerning the size and posterior extend of the cirrus pouch, and may be also that of the metraterm (Makarenko, 1958 on the kind of the latter anatomical element writes nothing). Such corrections would be in agreement with my thesis that the dimension and posterior extend of the cirrus pouch and the presence or lack of the metraterm are characteristics of a species, and not group value.

Subgenus *Lecithopyge* (Perkins, 1928) Dollfus, 1949

The ventral sucker smaller or equal to the oral sucker (in the latter case there may occur some dimensional fluctuations to the

benefit of one or the other sucker). Lack of the prepharynx. Oesophagus, if present, very short. The intestinal trunks extend almost to the posterior end of the body. The cirrus pouch of various length, frequently extends behind the posterior rim of the ventral sucker. The vitelline glands reach anteriorly various levels, sometimes both sides of the vitellaria join together before the ventral sucker. In the posterior end of the body (behind the posterior testis) the vitellaria of the two sides confluence together. The uterus may reach the anterior rim of the posterior testis, frequently penetrates into the space between the testes, never, however, extends posteriorly behind the level of the posterior testis. The metraterm present or lack.

Set of species:

- (1) *O. (L.) rastellus* (Olsson, 1876) Looss, 1907: *Rana temporaria* L.;
- (2) *O. (L.) megastomus* Baer, 1943: *Neomys fodiens* Schreb.
- (3) *O. (L.) fastuosus* (Szidat, 1924) nov. comb. (Syn.: *Plagiorchis fastuosus* Szidat, 1924, *Plagiorchis morosovi* Sobolev, 1946): *Tringa alpina* L., *T. ochropus*, *Actitis hypoleucos*;
- (4) *O. (L.) arcuatus* (Strom, 1924) nov. comb. (Syn.: *Plagiorchis likuoliangi* Tang, 1941): *Suncus murinus*;
- (5) *O. (L.) obtusus* (Strom, 1940) nov. comb. (Syn.: *Plagiorchis obtusus* Strom, 1940): *Rhyacophilus ochropus*.

Both Dollfus (1949) and Odening (1958) place the species: *Plagiorchis fastuosus* Szidat, 1924 and *Plagiorchis arcuatus* Strom, 1924 within the subfamily *Opisthioglyphinae*.

Fedorova (1954), Bychovskaja-Pavlovskaja (1956) and Odening (1958) regard as synonymous *Pl. fastuosus* and *Pl. morosovi* with the species *Pl. nanus* (Rudolphi, 1802). As far as *Pl. fastuosus* and *Pl. morosovi* seem to be the same species, to regard them as synonymous with *Pl. nanus* arises serious doubts. In the two first mentioned species the uterus by its posterior end corresponds to the basic characteristic of *Opisthioglyphinae*. However, according to Braun's (1902) description (cited after Skrjabin et Antipin, 1958) *Pl. nanus* is characterized by a uterus of the *Plagiorchiinae* type, that is by an uterus which reaches the posterior end of the body. In this light *Pl. nanus* would represent not only a separate species, but would classify itself to another genus and subfamily. The lack of the corresponding original literature is the source of certain doubts as regards the species *Pl. mustelae* Petrov et Kadenazii from *Mustela erminea aestiva*

and *Pl. javanensis* Sandground, 1940 from the man. Descriptions of the species presented in the monography of Skrjabin et Antipin (1958) do not state clearly what the posterior borderline of the extend of the uterus is. The drawings show that the posterior extend of the uterus does not reach behind the posterior testis. If the drawings reflect the real course of the uterus, both species should be transferred to the genus *Opisthioglyphe* and subgenus *Lecithopyge*.

Characteristic of the genus
Opisthioglyphe Looss, 1899 emend.

Opisthioglyphinae: Trematodes not large (from a fraction of a millimetre to few millimetres in length), pear-like, oval or tongue-like in shape. Cuticle as a rule covered with spines. Relations between the two suckers various. The pharynx clearly marked. Prepharynx, if present, short. Oesophagus, if present, most commonly short. Intestinal trunks long, reach almost or completely the posterior end of the body. Genital pore between the intestinal bifurcation and the ventral sucker, usually located laterally to the median line of the body. Cirrus pouch of various length and various posterior extend. Cirrus contains vesicula seminalis and pars prostatica.

Testes in the posterior half of the body, located one behind the other, perpendicularly or obliquely. Ovary in front of the testes, as a rule near the posterior rim of the ventral sucker, located laterally. Uterus occupies uniformly the space between the testes and the ventral sucker, may penetrate between the testes, never reaches posteriorly behind the level of the posterior testis. Metraterm present or lack. Vitelline glands, located laterally, always reach the posterior end of the body. Their anterior extend various. They may confluence together in the anterior part of the body before the ventral sucker, as they also may in the posterior part of the body behind the posterior testis. Urinary bladder in the form of the letter Y. Its bifurcation is located on the level of the testes. Parasites most commonly of the alimentary tract of: amphibians, birds and mammals.

Cercariae: *Xiphidiocercariae* (*Cercariae armatae*).
Typical species: *O. ranae* (Froelich, 1791).

Opisthioglyphe (O.) locellus Kossack, 1910Syn.: *O. (Neoglyphe) oschmarini* Shaldibin, 1953

Shaldibin (1953) describing the new species *O. oschmarini* regards it as very close to *O. locellus*. In the differential diagnosis this author motivates the separation of his material into the new species by the presence of the prepharynx, by the curvature of the

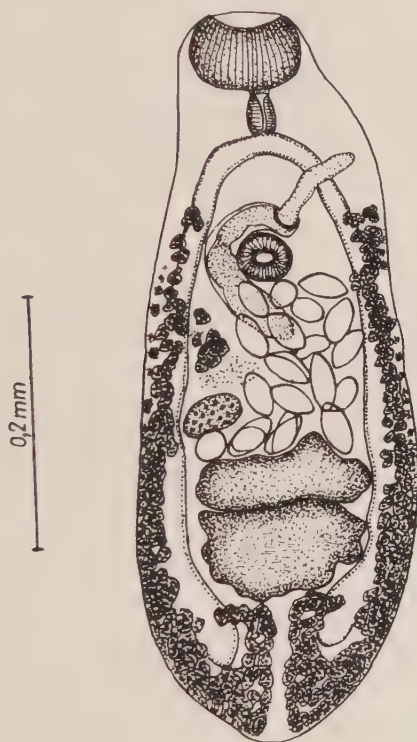


Fig. 3. *Opisthioglyphe (Opisthioglyphe)*
locellus Kossack, 1910.

cirrus pouch of an 180 degree angle (in *O. locellus* the described angle is 90 degree) and by the lack of a notch on the posterior end of the body (the posterior end bluntly pointed).

In my material from *Insectivora* of the family *Soricidae* I found in 2 *Neomys fodiens* in the stomach and intestine one in each specimen of the trematode, which corresponds by its general

outline to *O. locellus*. Because one of my specimens was damaged I have to base my further comparisons and review on the single preserved individual of this trematode. Distinct differences in comparison with the original description and drawing of Kossack (1910) pertain to the location of the ovary and shape of the posterior end of the body. In my specimen the ovary is receded back closer to the anterior testis, and in the place of the typical location of this gland in *O. locellus* (according to Kossack) there is and "islet" of the vitelline glands. The posterior end of the body is bluntly pointed and without a notch.

Dimensions of my specimen are shown in the table IV with comparison with Kossack's (1910) dimensions for *O. locellus* and that with Shaldibin's (1953) for *O. oschmarini*.

Table IV

Data	<i>O. locellus</i> Kossack, 1910	<i>O. oschmarini</i> Shaldibin, 1953	Author's data
length	0.506 — 0.592	0.680 — 1.164	0.638
Width	0.243 — 0.280	0.485 — 0.508	0.252
Oral sucker	0.105 — 0.075	0.085 — 0.153	0.091 × 0.062
Ventralsucker	0.065	0.062 — 0.102	0.046
Pharynx	0.04 × 0.03	0.034 — 0.068	0.037 × 0.027
Cirrus pouch	—	0.374 — 0.459	0.176
Testis I	—	0.204 — 0.323	0.156 × 0.052
Testis II	—	× 0.102 — 0.136	0.156 × 0.078
Ovary	—	0.115 — 0.153	0.063
Eggs	0.049 × 0.028	0.042 — 0.045 × 0.024 — 0.027	0.048 — 0.051 × 0.026 — 0.029
Host	<i>Neomys fodiens</i>	<i>Neomys fodiens</i>	<i>Neomys fodiens</i>
Habitat	intestine	intestine	stomach

The differences in the dimensions of the separate organs depending first of all on the general dimensional size of the examined specimens, on the state in which they were fixed, on the method of making preparations etc., cannot be decisive as regards the species separateness of the three compared materials. The shape of the posterior end of the body both in Shaldibin's material,

as well as also in my individual (lack of a notch and blunt sharpness) which differs from Kossack's corresponding data (a notch and flatness) should neither play any decisive role the more so that Kossack describing the typical configuration of the posterior end of the body of his material clearly informs that this characteristic occurs very often, but not always.

Can the bending of the cirrus pouch by which it describes such or another angle be a firm evidence to prove species separateness? The distinct mutability of the individual expressed in the shape and location of this organ, e. g. in *O. megastomus* Baer, 1943, is a sufficient answer to the above question.

The problem of the presence or absence of the prepharynx should, in my opinion, be reviewed extremely cautiously. We have too many examples of various approach to this problem in respect to some acknowledged species of trematode in the descriptions given by various authors. The cause of this lies in the first line in the degree of the length of the prepharynx as well as in the state in which the examined material was fixed.

Is the prepharynx so called short, when its length fluctuates within certain limits conditioned by individual and population mutability, and when the examined specimens may remain in a various state of contraction, this organ may be once invisible and another time it may be more or less distinctly marked.

Kossack did not find the prepharynx in his *O. locellus*. Shaldibin presents in his description of *O. oschmarini* the presence of the prepharynx, which, judging from the drawing, is short. In my individual the prepharynx is extremely short, what can form a certain kind of a bridge linking the data cited by the two mentioned authors.

On the basis of this review I arrived to the conclusion that the discussed materials of the three investigators represent the same species, that is *O. locellus* Kossack, 1910. The differences occurring in the dimensions or in anatomical features are manifestations of population or individual mutability (most probably in this way should be respected the displacement of the ovary towards the posterior part in my individual).

Final hosts: *Neomys fodiens* Schreb. (according to Kossack, 1910, Szidat, 1928, Shaldibin, 1953, Stammer, 1955, and Żarnowski) and *Sorex araneus* L. (according to Stammer, 1955).

Habitat: stomach, intestine.

Geographical distribution: U.S.S.R. (Kuron Halfisland — according to Kossack, 1910, and Szida[†], 1928, and Mordava A.S.S.R. — according to Shaldibin, 1953); Germany (according to Stammer, 1955); Poland (environs of Puławy).

Opisthioglyphe (R.) exasperatum (Rudolphi, 1819)

Dollfus, 1949

Syn.: *Distoma exasperatum* Rudolphi, 1819; *Distoma rubens* Dujardin, 1845; *Plagiorchis exasperatus* (Rudolphi, 1819); *Echinostomum exasperatum* (Rudolphi, 1819) Nicoll, 1923; *Distomum exasperatum* (Rudolphi, 1819) exempl. A et B — Szidat, 1928; *Plagiorchis microti* Sołtys, 1949.

I found this species in 5 *Sorex araneus* L., 4 *S. minutus* L., and 2 *Crocidura leucodon* Herm. The largest number of trematodes in one host individual was 5 specimens. Regardless on the species of the host, the stomach was the habitat.

My material corresponds wholly to the descriptions of this species in the present literature. Stress should be laid on the variability of the location of the vitelline glands, which is a manifestation

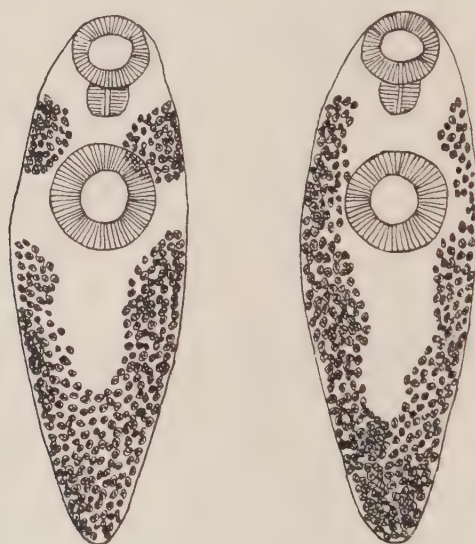


Fig. 4. *Opisthioglyphe (Rubenstrema) exasperatum* (Rudolphi, 1819) — variability in arrangement of vitellaria (schematic).

of mutability reigning within the species. As far as the general extend of the vitellaria (from the pharynx to the posterior end of the body) is unchangeable, the detailed plan of the location of these glands presents two extreme types, between which a number of transitions can be observed.

The first extreme type of the location of the vitellaria corresponding to Dollfus' (1949), Sołtys' (1952) data and more or less also to the Szidat's (1928) *A.* specimen, is characterized by a division of the vitellaria into two lateral groups: the anterior and posterior (on each side of the trematode), between which on the level of the ventral sucker appears a distinct break. The second extreme type, to which corresponds more the specimen *B* of Szidat (1928) is characterized by the absence of division of the vitelline glands into two groups. They extend without any break from the pharynx to the posterior end of the body. The enclosed two schematic drawings represent the extreme variabilities in the location of the vitellaria in the most natural way.

Final hosts: *Neomys fodiens* Schreb., *N. anomalus milleri* Mottaz (according to Sołtys, 1954), *Sorex araneus* L., *S. minutus* L., *S. macropygmaeus karpiński* Dehnel (according to Sołtys, 1954), *Crocidura leucodon* Herm.

Habitat: stomach, intestine.

Geographical distribution: Austria (according to Bremser, descriptions: Rudolphi, 1819 and Braun, 1907), France (according to Dujardin, 1843 and Dollfus, 1949), Czechoslovakia (according to Prokopič, 1956, 1959), Great Britain (according to Baylis, 1928), U.S.S.R. (Kuron Halfisland according to Szidat, 1928), Poland (Białowieża according to Sołtys, 1952, 1954; Turew n/Poznań according to Pojmańska, 1957; Puławy).

Opisthioglyphe (R.) opisthovitellinus (Sołtys, 1954)
Prokopič, 1959

Syn.: *Distoma exasperatum* (Rudolphi, 1819) exempl. C — Szidat, 1928; *Plagiorchis opisthovitellinus* Sołtys, 1954.

I found this species in two *Sorex araneus* L., in each there was one specimen of the trematode. In the first host this parasite was found in the intestine while simultaneously in the stomach was *O. exasperatum* (Rudolphi, 1819). In the second host an immature specimen (absence of eggs in the uterus) was found in the stomach.

My material corresponds completely to the corresponding literature in the descriptions given by Szidat (1928), Sołtys (1954) and Prokopič (1959). The anterior borderline of the vitelline glands lies on the level of the ovary and the posterior rim of the ventral sucker. More to the front there are no vitellaria. Attention

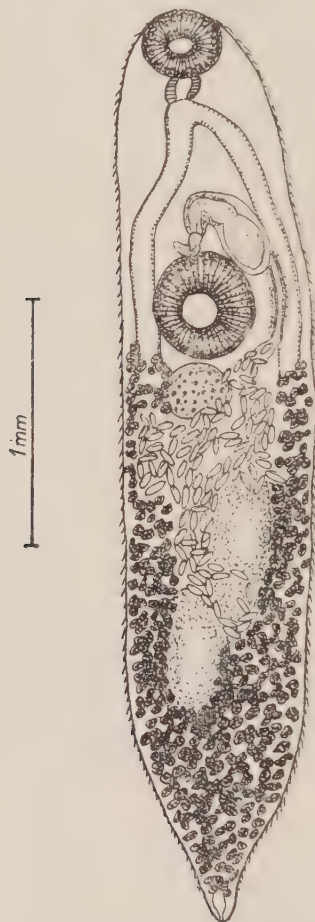


Fig. 5. *Opisthioglyphe (Rubenstrema) opisthovitellinus*
(Sołtys, 1954).

draws the variability of the location of the cirrus pouch in my material. While in the mature specimen the posterior part (containing vesica seminalis) of the cirrus pouch is located on the left side of the ventral sucker, in the immature specimen this part of the cir-

rus pouch is on the right side of the ventral sucker (in accordance with the data of other authors). The metraterm, provided with thick walls, is surrounded by glandular cells and extends in the two cases on the left side of the ventral sucker (typically).

In the enclosed table are shown dimensions (in millimetres) of the mature specimen jointly with the dimensions presented by Szidat (1928), Soltys (1954) and Prokopič (1959) for this species.

Table V

Data	<i>Distoma exasperatum</i> exempl. C Szidat, 1928	<i>Plagiorchis opistho- vitellinus</i> Soltys, 1954	<i>Opisthioglyphe</i> (R.) <i>opisthovi- tellinus</i> (Soltys, 1954) after Prokopič, 1959	<i>Opisthioglyphe</i> (R.) <i>opistho- vitellinus</i> (Soltys, 1954) author's data
Length *	3.0	2.28—3.5	2.2—3.5	3.91
Width	0.9	1.2	1.2—1.4	0.816
Oral sucker	0.4×0.4	0.4×0.4	0.45	0.287×0.356
Ventral sucker	0.6×0.6	0.5×0.5	0.5×0.55	0.471×0.425
Pharynx	0.1×0.15	0.1×0.1	—	0.114×0.122
Cirrus pouch	—	—	—	0.471×0.221
Testis I	—	0.52	0.52	0.586×0.460
Testis II	—			0.575×0.299
Ovary	0.15×0.15	0.21×0.25	—	0.275
Eggs	0.63—0.07	0.058×0.029	0.058—0.060	0.062—0.065
	× 0.03—0.035		× 0.028—0.030	× 0.028—0.031

The immature specimen measures 2.99 mm in length at the maximal width 0.724 mm. Dimensions of the ventral sucker 0.391 × 0.345 mm, dimensions of the oral sucker 0.253 × 0.276 mm.

Final hosts: *Neomys fodiens* Schreb., *Sorex araneus* L., *S. minutus* L., and *S. macropygmaeus karpiński* Dehnel.

Habitat: stomach and intestine.

Geographical distribution: U.S.S.R. (Kuron Halfisland, in *Neomys fodiens* Schreb. — according to Szidat, 1928); Poland (Białowieża National Park, in *Neomys fodiens* Schreb., *Sorex*

minutus L., and *S. macropygmaeus karpiński* Dehnel — according to Sołtys, 1954; Puławy, in *Sorex araneus* L.; Czechoslovakia (in *Sorex araneus* L. and in *Neomys fodiens* Schreb. — according to Prokopič, 1959).

Opisthorchiidae Braun, 1901

Metorchinae Lühe, 1908

Metorchis albidus (Braun, 1893) Looss, 1899 forma *minor*
Dollfus et Callot, 1944

Syn.: *M. revilliodi* Baer, 1931.

In one *Neomys fodiens* Schreb. I found in the gall-bladder this species, whereby the number of the specimens amounted to over 30. My material corresponds to the data in the literature (Baer, 1932, 1943; Dollfus et Callot, 1944/45; Sołtys, 1954; Prokopič, 1959).

Hosts: (1) *Canis familiaris* L., *Vulpes fulvus*, *V. vulpes* (L.), *Felis catus* L. *domesticus*, *F. catus* L. *ferus*, *Putorius putorius* L., *Halicherus grypus* (Fabr.) — for *Metorchis albidus* (Braun, 1893);

(2) *Neomys fodiens* Schreb. — for *Metorchis albidus* (Braun, 1893) forma *minor* Dollfus et Callot, 1944.

Habitat: bile ducts in the liver and gall-bladder.

Geographical distribution: for *M. a.* forma *minor*: Switzerland, France, Poland (Białowieża, Puławy), Czechoslovakia.

Dicrocoeliidae Odhner, 1911

Dicrocoeliinae Looss, 1899

Dicrocoelium sp.

I am able only to signalize the presence in my material of 1 specimen of the trematode of the genus *Dicrocoelium* Duj., 1845, found in *Sorex araneus* L. in the gall-bladder. Unfortunately I am not able to present closer data because in the course of making a preparate this specimen was damaged.

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STRESZCZENIE

Autor podaje wyniki swych badań nad fauną przywr pasożytniczych u drobnych ssaków leśnych (*Rodentia* i *Insectivora*) okolicy Puław. Stwierdzono następujące gatunki:

1. *Plagiorchis stefañskii* Furmaga, 1956 z *Apodemus agrarius* Pall.

2. *Opisthioglyphe* (*Opisthioglyphe*) *locellus* Kossack, 1910 z *Neomys fodiens* Schreb.

3. *Opisthioglyphe* (*Rubenstrema*) *exasperatum* (Rud., 1819) z *Sorex araneus* L., *Sorex minutus* L. i *Crocidura leucodon* Herm.

4. *Opisthioglyphe* (*Rubenstrema*) *opishovitellinus* (Sołtys, 1954) z *Sorex araneus* L.

5. *Brachylaemus fulvus* Duj., 1843 z *Sorex araneus* L.

6. *Metorchis albidus* (Braun, 1893) forma *minor* z *Neomys fodiens* Schreb.

7. *Dicrocoelium* sp. z *Sorex araneus* L.

Równocześnie przeprowadza autor krytyczną analizę stosunków systematycznych w obrębie rodziny *Brachylaemidae* ze szczególnym uwzględnieniem podrodziny *Brachylaeminae*, a także w obrębie rodziny *Plagiorchiidae*. Odnośnie tej ostatniej rodziny autor porusza kwestię zestawu gatunkowego rodzaju *Plagiorchis* Lüh e, 1899 oraz rozpatruje szczegółowo podrodzinę *Opisthioglyphinae*, stosunki systematyczne wewnątrz rodzaju *Opisthioglyphe* Looss, 1899, a także listę gatunków wchodzących w skład tego rodzaju.